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Phonological Processes in Kannada Speaking Identical Twins

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Abstract

Children make predictable pronunciation errors during normal speech development. These 'errors' are called phonological processes. This study investigated the various phonological processes occurring in Kannada speaking monozygotic twins (identical twins). Two pairs of monozygotic twins (all were females) with the age of 3 years participated in this study. The Kannada Articulation Test (Babu, Ratna, & Bettagiri, 1972) was selected as test material for this study. Word repetition task was used to elicit responses from the subjects. The analysis of speech samples revealed the presence of six various phonological processes. It was found that five phonological processes were common in both the twin pairs. The findings highlighted the influence of genetics and environmental factors that contribute to the similarity between co-twins. However, further research is warranted for substantiation.

Key words: Phonological processes, Monozygotic twins, Kannada.

Introduction

The concept of phonological processes was introduced by Stampe (1973) to explain systematic sound changes made by children in producing adult words. As each child matures, these process errors are suppressed or eliminated until the child's phonological system matches that of the adult model. But if they persist, in children they can be a sign of a phonological disorder. So and Dodd (1995) reported that, the ages by which the child discontinues the use of phonological processes vary by languages.

Twin studies are the most common type of study used to investigate the impact of genetic factors on language. There are two types of twins, monozygotic (MZ) and dizygotic (DZ) twins. Dizygotic twins result from two different fertilized eggs. Monozygotic twins, also called identical twins, are the result of a single fertilized egg splitting into two individual cells and developing into two individuals. MZ twins share 100% of their alleles and, on average, DZ twins share only 50% of alleles. Therefore, if MZ twin pairs' linguistic abilities are more similar than DZ twin pairs' (Stromswold, 2006).

Plomin and Kosslyn (2001) reported that, .MZ twins show very high levels of similarity in the brain structures which assist speech and language input and output processing. Monozygotic (MZ) twins share both articulation and misarticulation patterns (Matheny & Bruggemann, 1973; Locke & Mather, 1989). The studies on phonological acquisition in twins have suggested that monozygotic twins are more similar than dizygotic twins (Lewis and Thompson, 1992).

The similarity between twins on any particular trait is reported to be due to genetic influences and any environmental influences that contribute to the similarity between co-twins (Kovas, et al. 2005). Stromswold (2001) analysed various aspect of language from 100 twin studies. Results reveal that for both language-impaired and normal twins, genetic factors play a greater role for phonological and syntactic abilities than for lexical abilities.

Kovas, et al. (2005) studied genetic and environmental etiologies for articulation, phonology, grammar, vocabulary, and verbal memory in 787 pairs of 4½ year-old same-sex and opposite-sex twins. Result revealed that moderate genetic influence was found for all aspects of language. Environmental influence was mainly due to non-shared factors. Genetic and environmental influences on language ability and disability were found to be quantitatively and qualitatively similar for males and females.

Reports from the literature highlight the impact of genetic and learning environment on development of speech and language skills based on twin studies. It is also reported that,

monozygotic twin pairs' linguistic abilities are more similar than dizygotic twin pairs. Hence, this study is an attempt to understand the phonological processes pattern in monozygotic twins (identical twins).

Objective

To identify the type of phonological processes present in Kannada speaking 3 years old monozygotic twins.

Method

Participants: Two pairs of monozygotic twins (all were females) with the age of 3 years participated in this study. Participants were monolingual Kannada speakers and had the Mysore dialect of Kannada. They were from upper middle class families. Participants were screened for normal Speech and Language skills, Cognitive skills, Motor development and Hearing ability.

Material: The Kannada Articulation Test (Babu, Ratna, & Bettagiri, 1972) was used as test material. 52 words were selected. Vowels and consonants were tested in initial, medial and final position of the word.

Procedure: Informed consent was obtained from the parents of children who participated in this study. Each participant was tested individually in a noise free room. Once the rapport was established, the examiner presented the stimulus one after another. Participants were instructed to repeat the words after the examiner. The response obtained was audio recorded using a digital tape recorder. All participants were provided with reinforcements.

Data Analysis: The recorded speech samples were analyzed and transcribed by two Speech Language Pathologists using broad and narrow IPA transcriptions. Sound-by-sound analyses were carried out. Based on the sound changes the phonological processes were identified.

Results and Discussion

Phonological processes identified from the word level utterances of monozygotic (MZ) twins (identical twins) are presented below (see table: 1)

	Twin pair 1 (T1)		Twin pair 2 (T2)	
	T1a	**T1b**	**T2a**	**T2b**
1	Velar Fronting	Velar Fronting	Velar Fronting	Velar Fronting
2	Retroflex Fronting	Retroflex Fronting	Retroflex Fronting	Retroflex Fronting
3	Cluster Reduction	Cluster Reduction	Cluster Reduction	Cluster Reduction
4	Affrication	Affrication	Affrication	Affrication
5	Stopping	Stopping	Stopping	Stopping
6	Devoicing	Devoicing	-	-

Table 1: Phonological processes seen in 3 years old monozygotic twins

As shown in the above table: 1, six phonological processes were identified from the word level utterances of 3 years old identical twins; **(1) Velar Fronting**: velar sounds are replaced with a sound that is made toward the front of the mouth / made with the front of the tongue. **(2) Retroflex Fronting:** retroflex sounds are replaced with a sound that is made toward the front of the mouth / made with the front of the tongue. **(3) Cluster Reduction:** reduction of consonant cluster to a single consonant. **(4) Affrication:** nonaffricate sounds is replaced with an affricate. **(5) Stopping:** substitution of a stop for a fricative. **(6) Devoicing:** voiced consonant is substituted with a voiceless consonant.

The results of this study revealed that, except for devoicing processes, rest of the five phonological processes were seen in both the monozygotic twin pair (**Twin pair 1 & Twin pair 2).** In **Twin pair 1 (T1)** phonological processes identified in both the children **(T1a and T1b)** were: Velar Fronting, Retroflex Fronting, Cluster Reduction, Affrication, Stopping, and Devoicing. In **Twin pair 2 (T2)** five phonological processes were identified: Velar Fronting, Retroflex Fronting, Cluster Reduction, Affrication, and Stopping. All five processes were seen in both the children **(T2a and T2b).**

The findings of this study are in line with studies reporting that monozygotic (MZ) twin pairs' articulation pattern, phonological acquisition, linguistic abilities are more similar than dizygotic (DZ) twin pairs' (Matheny & Bruggemann, 1973; Locke & Mather, 1989; Lewis and

Thompson, 1992; Stromswold, 2006). The similarity between twins on any particular trait may be due to genetic influences (Stromswold, 2001) genetic and shared environment influences (Kovas, et al. 2005).

The studies mentioned above have focused more on comparison between MZ & DZ twins. The focus of the present study was to identify phonological processes in MZ twins. This study was not designed to compare the performance between MZ & DZ twins. However, when looked into the results of this study it supports the findings of earlier literature reports on monozygotic twins. This type of similarity among MZ twin pairs may be there because MZ twins share 100% of their alleles (Stromswold, 2006). Twins live in the same family, exposed to the same quality and similar quantity of linguistic input.

Conclusion

The current study supported the findings of previous studies on monozygotic twins. The results of this study have shown that, there exists similarity in occurrence of various phonological processes among the Kannada speaking 3 years old monozygotic twin pairs. The main limitation of this study is small sample size. Hence, results cannot be generalized. However, this study provides a basis for further investigation in this regard in various languages. Further comparison between monozygotic (MZ) and dizygotic (DZ) twins can also be studied on the same line.

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